Humidification aspects in AeroCom A and B

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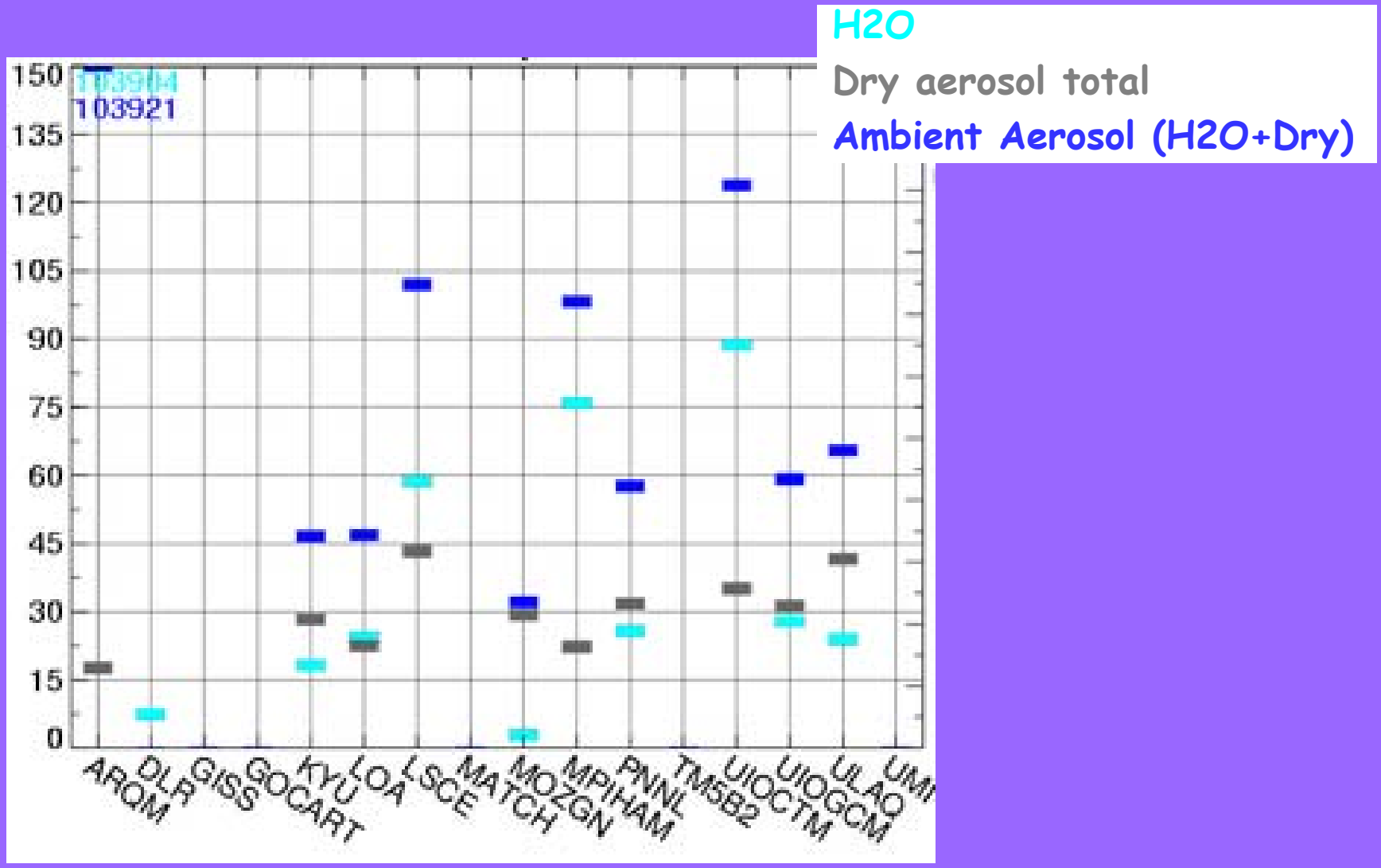
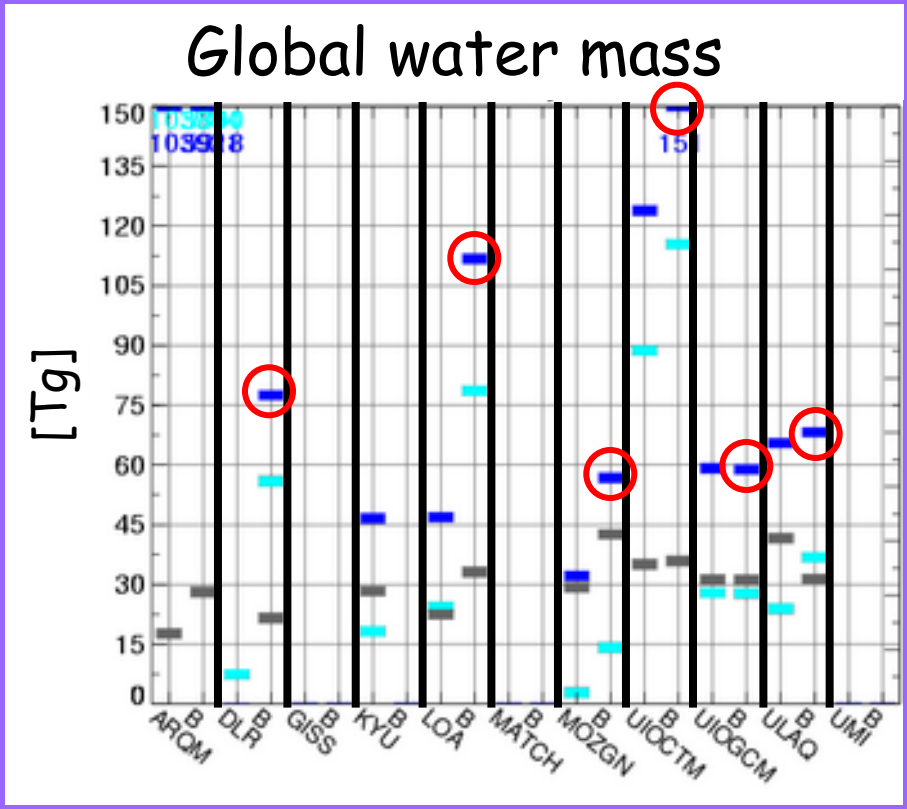
Global masses of H2O, dry aer & ambient aer

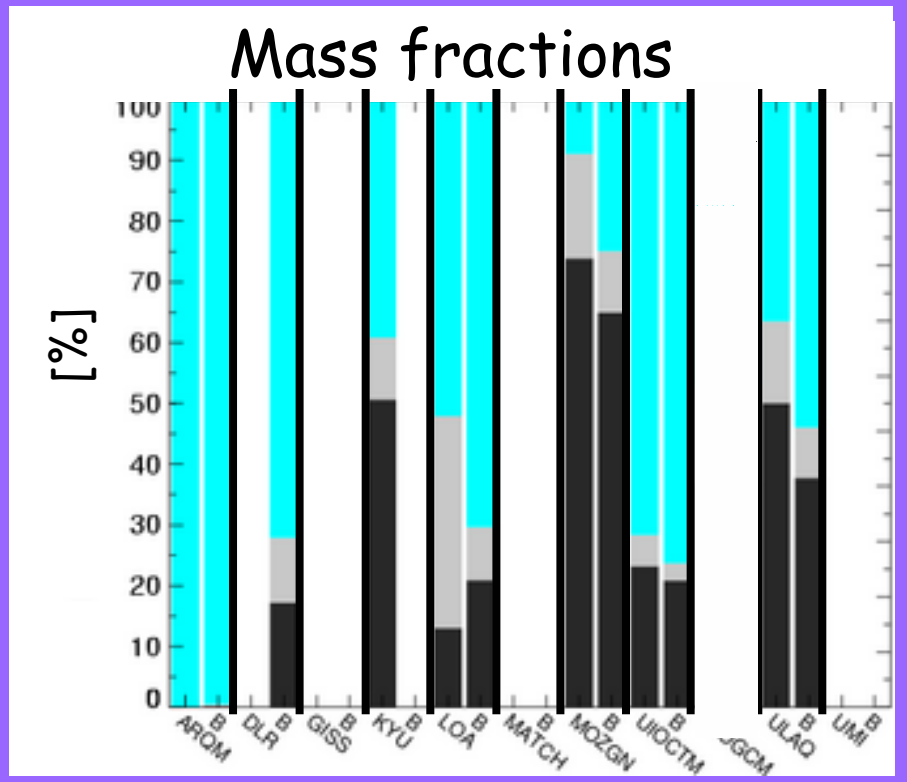


Exp A: Very high diversity of aerosol water !

AERH2O in Exp A and B

H2O
Dry aerosol total
Dry aerosol d< 1μm
Dry aerosol d> 2.5 μm
Ambient Aerosol (H2O+Dry)





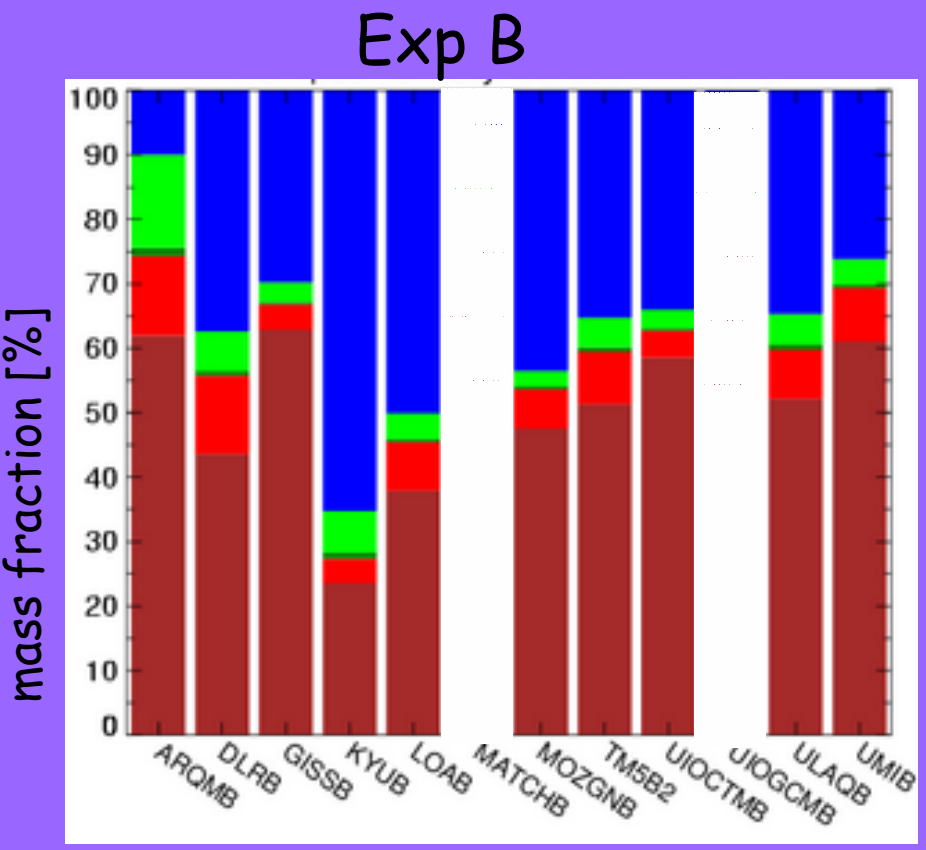
Diversity H2O Mass (\ARQM)

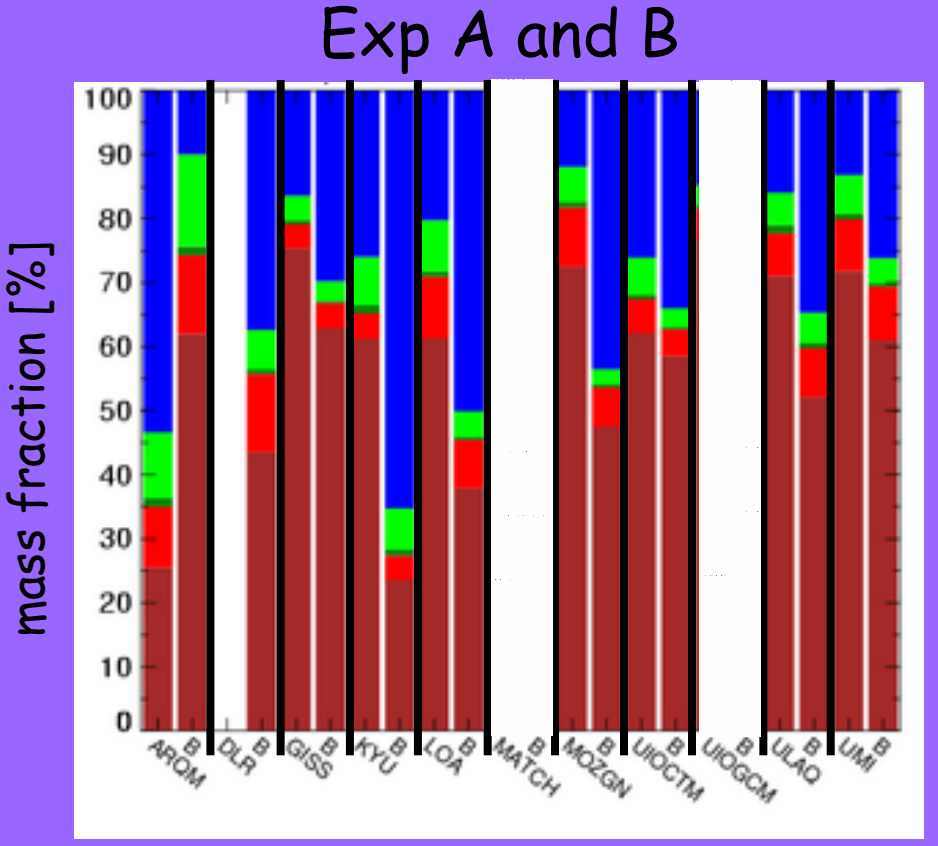
Exp	#	Mean	Median	Div
A	10	34	25	82
B	6	55	46	68

Diversity H2O Mass Fraction (\ARQM)

Exp	#	Mean	Median	Div
A	9	48	47	42
B	6	57	62	34

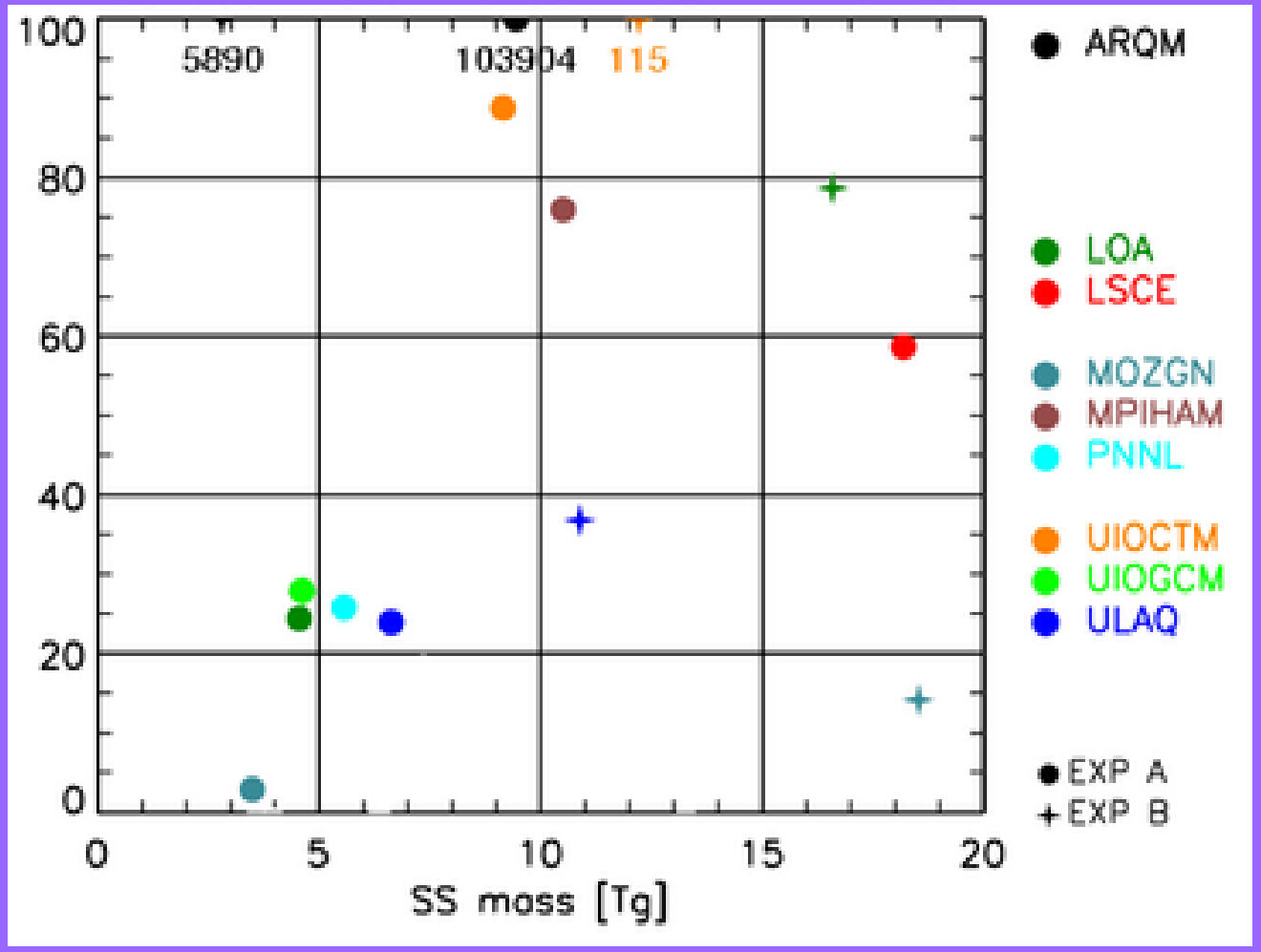
Composition of dry aerosol





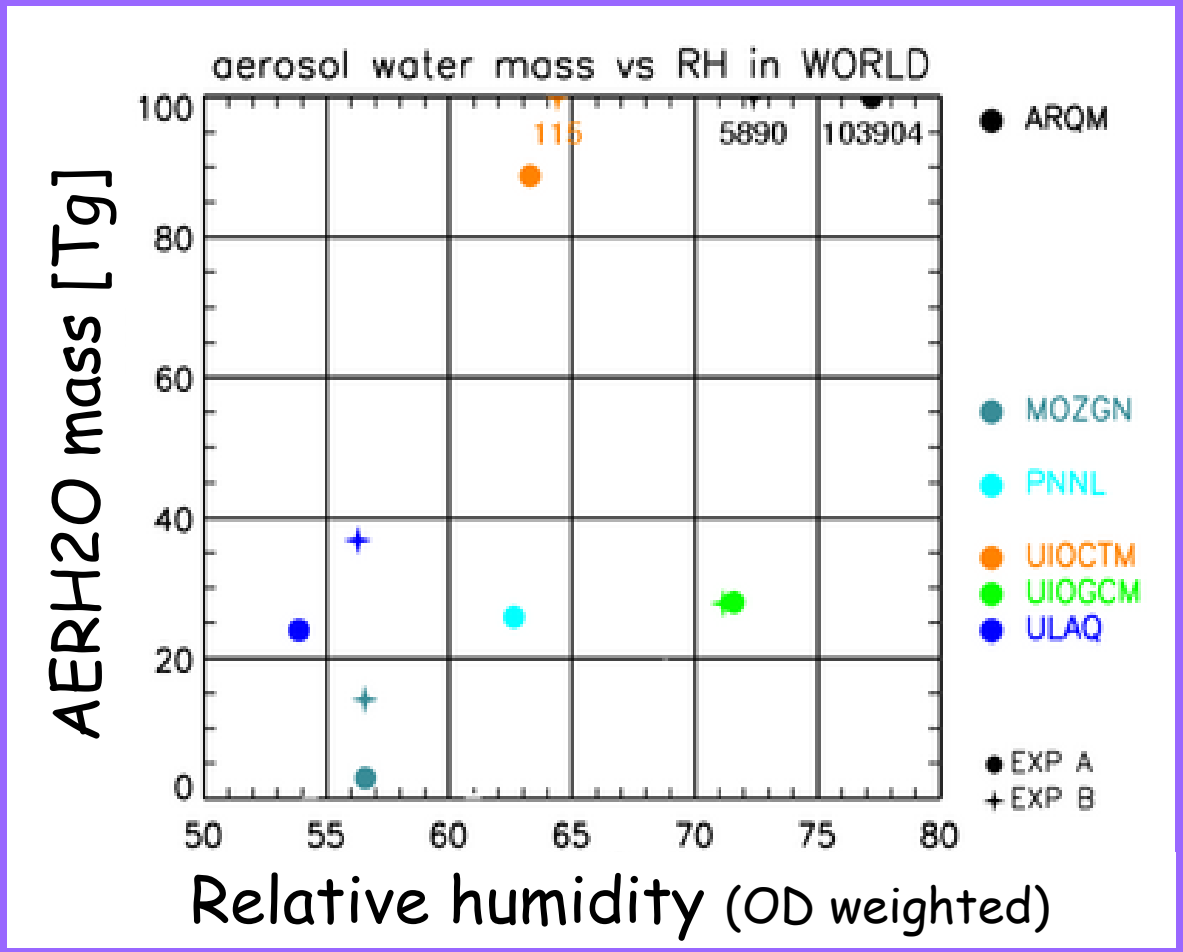
Harmonized emissions do not lead to similar compositions.

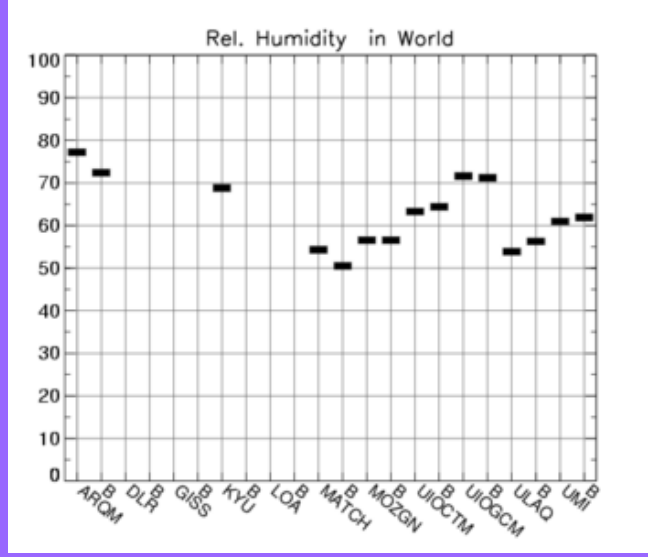
Global annual mean masses: aerosol water versus sea salt



Global annual mean sea salt mass [Tg]

Global mean aerosol water mass versus relative humidity

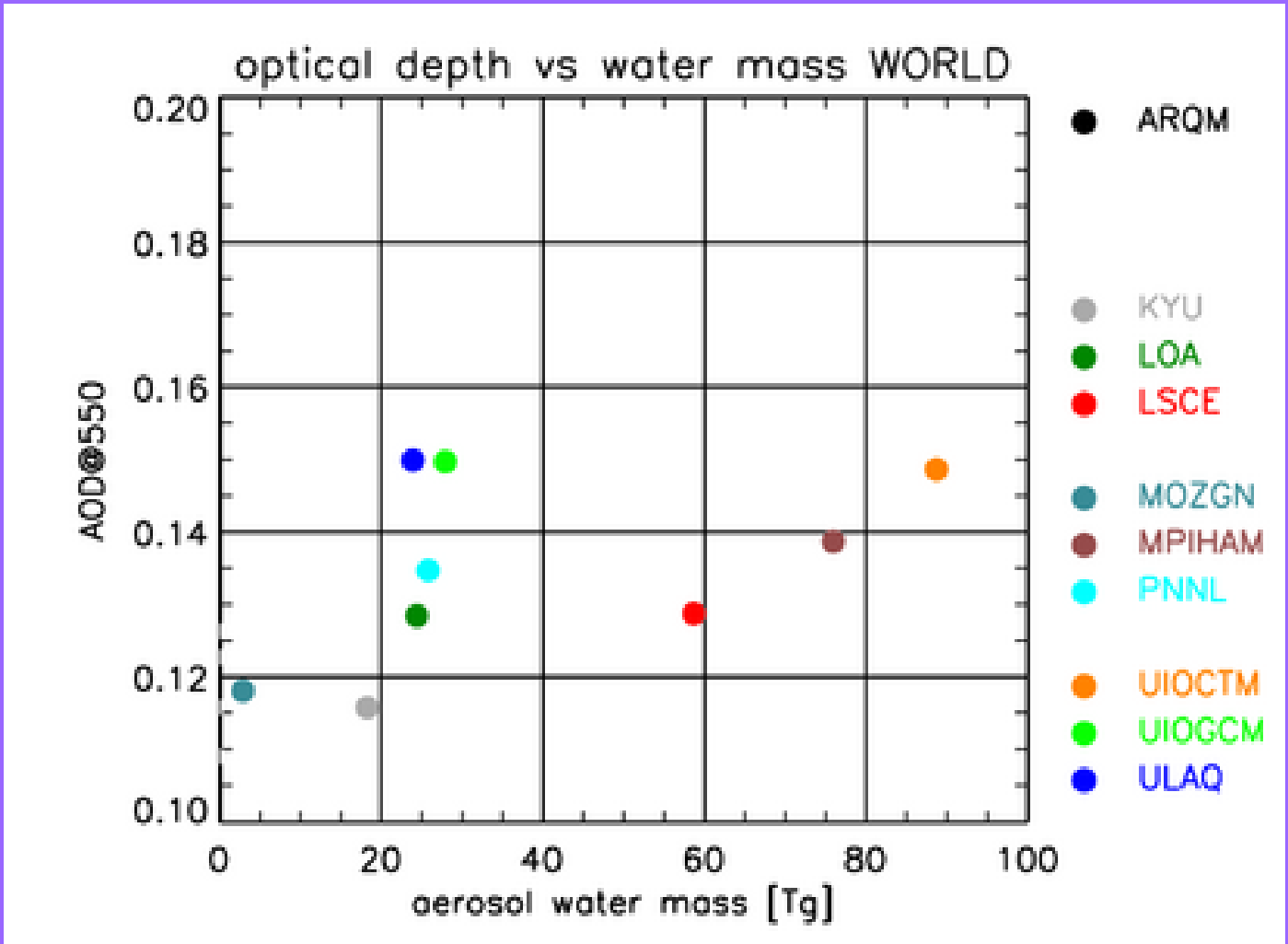




Parameterizations of aerosol water uptake

	Reference	RH [1]	RH max [2] [%]
ARQM	[Hänel, 1976]	mean	100
DLR	aerosol liquid water content calculated by EQSAM (SO4/NH4/NO3/H2O system, [Metzger et al., 2002a; Metzger et al., 2002b], assuming thermodyn equilibrium	mean	99.8
GISS	[Schmidt and others, 2005] based on [Tang et al., 1981; Tang and Munkelwitz, 1991; Tang and Munkelwitz, 1994; Tang, 1996]	mean	99.9 (different value for radiation)
GOCART	[d'Almeida, 1991] for BC, [Koepke et al., 1997] for the other components	mean	none
KYU	SO4: [Tang and Munkelwitz, 1994], carbonaceous: [Hobbs et al., 1997], SS: 30% water, DU: hydrophobic	mean	none
LSCE	parameterization adjusted to [Gerber, 1991]	mean	
LOA	SO4 [Tang and Munkelwitz, 1994], SS [Tang et al., 1997], soluble POM as SO4	fraction	95
MATCH	BC, POM, SS [Hess et al., 1998]		
MPI HAM	[Vignati et al., 2004]	complex, fraction	complex
MOZGN	SO4 [Tang and Munkelwitz, 1994], SS [Tang et al., 1997], POM [Ming and Russell, 2001]	mean	95
PNNL	Kohler theory [Pruppacher and Klett, 1997; Ghan, 2001] for internal mixture of soluble, insoluble component. Volume mean hygroscopicity. Deliquescence depends on RH and aerosol water from previous timestep.	mean	100
TM5	SS: [Gerber, 1991], SO4/NO3 [Metzger et al., 2002b]	fraction	complex
UIO_CTM	[Fitzgerald, 1975]	mean	99.5
UIO_GCM	[Kirkevåg and Iversen, 2002]	mean	98

Aerosol water and optical properties



AOD550 = 3*opt_prop/(4*rho*r_eff) *(water+dryload)

Chin et al., JAS 59, 461-483,2002

Conclusions

- Aerosol water uptake is one of the major uncertainties in global aerosol modelling.
- It depends on local RH & composition.
- Large differences for composition and AERH2O in Exp B.
- Implications on radiative properties !